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ABSTRACT

This guide consists of examples and blank worksheets to aid Oklahoma schools in assessing their science curriculum on a continuing basis. Worksheets focus on: (1) philosophy and rationale of science curricula; (2) expected student outcomes; (3) educational programs (topics covered and concepts emphasized); (4) student skills; (5) program evaluation (organization, facilities, equipment, and instruction); (6) resource directory; and (7) needs and recommendations. (SK)

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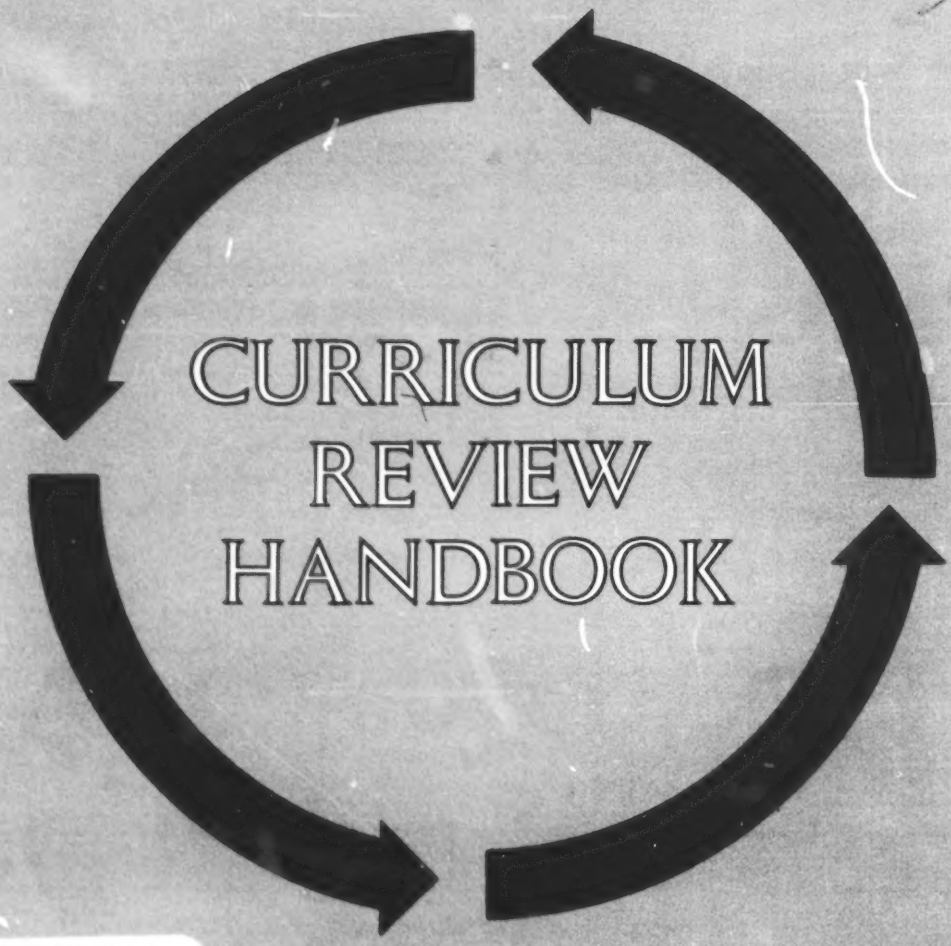

CURRICULUM REVIEW HANDBOOK

SCIENCE

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OKLAHOMA STATE DEPARTMENT OF EDUCATION

SE 026 373

CURRICULUM REVIEW HANDBOOK

SCIENCE

1981-82

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FOREWORD

The impact of the knowledge explosion necessitates a continuing review of science curriculum. The rapidity of change has made it difficult for teachers and schools to adjust their local science curriculum to meet students' and society's needs.

This guide was developed to encourage and aid local schools in assessing their science curriculum on a continuing basis. It provides a tool to determine what is being taught and to decide what should be taught in science. An evaluation of this review will lead to a plan of action to implement any desired changes.

Leslie Fisher
State Superintendent
of Public Instruction

ACKNOWLEDGEMENTS

The following committee members devoted many hours in the development of this Curriculum Review Handbook. They represent the many dedicated teachers in our state who continually strive to improve the quality of education in Oklahoma. Their contribution is gratefully acknowledged.

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PHILOSOPHY AND RATIONALE

Phi-los-o-phy: noun; theory or logical analysis of the principles underlying conduct, thought, knowledge and the nature of the universe

A statement of philosophy provides an operational foundation for the curriculum writer. In general, the aspects considered fundamental to the purpose of science education are outlined. The statement orients and colors the subject matter included in and provides purpose to class activities. The philosophy is a general statement of purpose and belief reflecting the concerns of the community. The philosophy expresses the teacher's understanding of the needs of students and society and states the role of the teacher in providing for these needs.

The following statement may be used as a pattern, but the unique nature of the local school community should be considered in developing the philosophy:

> The science curriculum should be presented in a holistic and integrative manner that is tied to student needs, local situations, and societal issues. It should be experiential, whenever possible, so that students can practice essential skills.

Complete these statements:

I believe the unique nature of science is _____

_____

_____

The backgrounds, abilities, and interests of my students are _____

_____

_____

The distinct needs of this community are _____

_____

_____

My responsibilities as a science educator are _____

_____

_____

I believe the ultimate purpose of science education is _____

_____

_____

* * *

To write the philosophy statement on the following page, review your responses to the above statements, and then explain why science is included in your curriculum.

PHILOSOPHY AND RATIONALE

for

_____School (s)

_____, Oklahoma

19___

EXPECTED STUDENT OUTCOME

Developing a list of objectives that is compatible to the stated philosophy will help determine future classroom activities. In writing these objectives, consider the various types of science skills a student should experience in order to become a lifelong learner and problem solver. For example, if student awareness of the energy crisis is an objective, then classroom activities should be provided to accomplish that objective. Some expected student outcomes are:

1. Develop motor skills
2. Interpret information
3. Improve communication
4. Develop social skills
5. Develop keen observation and critical thinking
6. Develop self motivation and initiative
7. Foster natural curiosity
8. Exhibit awareness of environmental problems, such as:
   a. Energy crisis
   b. Water crisis
   c. Drug use
9. Develop concern for improvement of quality of life
10. Understand the relationships of matter, life, and energy
11. Develop skill in finding and using science materials and equipment
12. Desire to choose science as a career.

Develop your own list of objectives according to local needs.

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

11.

12.

13.

14.

15.

16.

17.

18.

19.

20.

21.

22.

23.

EDUCATIONAL PROGRAM
Outline, Concepts, Skills

The following pages are provided for use in describing your existing science program. Make a copy for each course taught and list the topics covered along with the related concepts. Below are two partial examples.

Science Course Title Science

Grade Level Fifth Grade

Topics Covered	Concepts Emphasized
1. Sound	Sound travels, travels in different directions, different speeds
2. The Earth	Gravitation, inertia, rotation, revolution, distance, motion

Science Course Title Physical Science

Grade Level Ninth Grade

Topics Covered	Concepts Emphasized
1. Matter	Definition, standard units of measure, composition, classification, properties, change of state, Periodic Table, chemical change, conservation
2. Energy	Definition, types, forms, relationship to matter, conservation
3. Mechanical	Definition, Laws of Motion, transformation, work power, machines
4. Thermal	Definition, transfer, transformation, temperature, heat engines

EDUCATIONAL PROGRAM WORKSHEET

Science Course Title _____

Grade Level _____

Topics Covered	Concepts Emphasized

13

EDUCATIONAL PROGRAM WORKSHEET

Science Course Title _____

Grade Level _____

Topics Covered	Concepts Emphasized

SKILLS WORKSHEET

Below is a list of skills developed through science courses. This list should be duplicated and given to each science teacher who would add others not listed. For each skill, check the appropriate column to determine if the skill is primarily used in science, shared with other subjects, or holistic, i.e., a lifelong skill.

Skill	Science	Shared	Holistic
Observing			
Classifying			
Inferring			
Predicting			
Measuring			
Communicating			
Interpreting data			
Defining			
Formulating questions and hypotheses			
Experimenting			
Formulating models			
Estimating			
Reading			
Writing			
Computing			
Graphing			
Reasoning			
Recording			
Comparing			

PROGRAM EVALUATION

Evaluate your current program by checking the response that best describes your situation for each item. Add other appropriate items if needed.

Organization	does not apply	needed	poor	fair	good	excellent
1. Class time length meets instructional needs.						
2. Few interruptions are made during class time.						
3. Teachers are given adequate preparation time.						
4. Teachers have opportunity for science staff development.						
5. Teachers participate in science staff development.						
6. A written scope and sequence of science curriculum is available to all science teachers.						
7. Science is a part of the daily elementary program.						
8. Procedures exist for regular reordering of supplies.						
9. A sufficient budget is provided for operation of science department.						
10. Teacher preparation in science subject matter is adequate.						

Facilities	does not apply	needed	poor	fair	good	excellent
1. Physical facilities accommodate students adequately.						
2. Laboratory facilities are satisfactory.						
3. Classroom lighting is adequate.						
4. Chalkboard space is sufficient.						
5. Bulletin board space is adequate.						
6. Acoustics are good.						
7. Sinks and running water are provided.						
8. Electrical outlets are sufficient in number.						
9. Working natural gas outlets exist.						
10. Equipment storage space is satisfactory.						
11. Office space is provided for teachers.						
12. Outdoor classroom space is provided.						
13. Space is provided for project work.						
14.						
15.						

Equipment	does not apply	needed	poor	fair	good	excellent
1. Safety provisions are adequate: (a) Fire extinguishers are provided.						
(b) Ventilation for noxious fumes exists.						
(c) First aid kit is accessible.						
(d) Storage of hazardous materials is appropriate.						
2. Instructional charts are used to illustrate concepts.						
3. Scientific models exist in good condition.						
4. The quality of materials is satisfactory.						
5. The quantity of materials available is adequate.						
6. The variety of materials provided is sufficient.						
7. Audiovisual materials are available and utilized.						
8.						
9.						
10.						
11.						

Instructional	does not apply	needed	poor	fair	good	excellent
1. Hands on experiences are provided for students to discover concepts taught.						
2. Course offerings meet the needs of gifted students.						
3. Course offerings meet the needs of learning disabled students.						
4. Reference materials are used.						
5. Opportunity for individualized instruction exists.						
6. Community resources are used.						
7. Students use science techniques and equipment.						
8. Students develop science skills through classroom activities.						
9. Diagnostic tests are used to plan courses and student placement.						
10. Field trips are provided.						
11. Instruction promotes acquisition and use of science process skills.						
12.						

RESOURCE DIRECTORY

In order to supplement instruction, many sources other than a textbook exist for enrichment. Since resources will vary from one community to another, add your own ideas to the categories provided.

LOCAL

1. Museums:

Contact: _____ _____ _____
Name: _____ _____ _____
Address: _____ _____ _____
Phone: _____ _____ _____

2. Libraries:
Community (public) or university

Contact: _____ _____ _____
Name: _____ _____ _____
Address: _____ _____ _____
Phone: _____ _____ _____

3. Industry:

Contact: _____ _____ _____
Name: _____ _____ _____
Address: _____ _____ _____
Phone: _____ _____ _____

4. Professionals, such as doctors, denists, lawyers:

Contact: _____ _____ _____
Name: _____ _____ _____
Address: _____ _____ _____
Phone: _____ _____ _____

5. Soil Conservation District Representative:

Contact: _____ _____ _____

Name: _____ _____ _____

Address: _____ _____ _____

Phone: _____ _____ _____

6. Utility Companies:

Contact: _____ _____ _____

Name: _____ _____ _____

Address: _____ _____ _____

Phone: _____ _____ _____

7. Hospital:

Contact: _____ _____ _____

Name: _____ _____ _____

Address: _____ _____ _____

Phone: _____ _____ _____

8. _____

Contact: _____ _____ _____

Name: _____ _____ _____

Address: _____ _____ _____

Phone: _____ _____ _____

9. _____

Contact: _____ _____ _____

Name: _____ _____ _____

Address: _____ _____ _____

Phone: _____ _____ _____

10. _____

Contact: _____ _____ _____

Name: _____ _____ _____

Address: _____ _____ _____

Phone: _____ _____ _____

STATE

1. Omniplex
   Jon Wagner, Education Director
   2100 N. E. 52nd
   Oklahoma City, Oklahoma 73111

2. Oklahoma Science Teachers Association
   c/o Oklahoma State Department of Education
   2500 North Lincoln Blvd.
   Oliver Hodge Building
   Oklahoma City, Oklahoma 73105

3. Oklahoma Academy of Science
   Noble Foundation
   Highway 70
   Ardmore, Oklahoma 73401

4. State Department of Education
   Science Specialist
   2500 North Lincoln Blvd.
   Oliver Hodge Building
   Oklahoma City, Oklahoma 73105

5. State Science Fair Director
   East Central University
   Ada, Oklahoma 74820

6. Oklahoma Wildlife Federation
   4545 North Lincoln Blvd.
   Oklahoma City, Oklahoma 73105

7. Oklahoma Forestry Division
   Capitol Building
   Oklahoma City, Oklahoma 73105

8. Climatological Survey
   815 Jenkins
   Norman, Oklahoma 73109

9. Oklahoma Geological Survey
   830 Van Fleet Oval, Room 163
   Norman, Oklahoma 73019

10. Oklahoma Aerospace Educators Association
    209 Poultry Science Bldg.
    Oklahoma State University
    Stillwater, Oklahoma 74078

NATIONAL

1. National Wildlife Federation
   1412 16th Street, N. W.
   Washington, DC 20036

2. NASA
   Manned Spacecraft Center
   Houston, Texas 77058

3. National Science Teachers Association
   1742 Connecticut Avenue, N. W.
   Washington, DC 20009

4. Conservation Education Association
   1981 Conference
   Warren Wilson College
   Swannanoa, North Carolina 28778

5. National Geological Survey
   213 Dean A. McGee
   Oklahoma City, Oklahoma 73069

6. National Biology Teachers Association
   11250 Roger Bacon Drive
   Reston, Virginia 22090

7. American Chemical Society
   1155 Sixteenth Street, N. W.
   Washington, DC 20036

NEEDS AND RECOMMENDATIONS

Review the checklist from the Program Evaluation to identify needs and make recommendations. Be specific.

A. Organization

B. Facilities

C. Equipment

D. Instruction

E. Other

CHECKLIST OF ESSENTIAL SKILLS

Using the Skills Worksheet on page 12, individual student progress may be monitored. The following form may be duplicated for use by teachers.

Student's Name_____

Course_____

Grade_____Year_____

Skill	Student Participation
Observing	
Classifying	
Inferring	
Predicting	
Measuring	
Communicating	
Interpreting Data	
Defining	
Formulating questions and hypotheses	
Experimenting	
Formulating models	
Estimating	
Reading	
Writing	
Computing	
Graphing	
Reasoning	
Recording	
Comparing	

PROGRAM DESCRIPTIONS

A brief description should be written for each science course offered. This could be used for enrolling purposes, informing parents, counseling students, and orienting transfer students. The description should include prerequisites and grade levels offered. Below are three descriptions as examples.

A. Elementary

Course Title Science
Grade Level Fifth
Prerequisites None

The first semester emphasizes the nature of science, characteristics of living things, structure and function of plants.

The second semester emphasizes the structure and function of animals, the interrelationships between plants, animals, and their ecosystems. The human body is studied relating to good nutrition, physiology, personal health and hygiene.

B. Middle School

Course Title General Science
Grade Level Eighth
Prerequisite None

A broad survey for an understanding of matter, life, and energy. Topics included are composition of matter, combustion and fuels, classification of living material, human body systems, nutrition and health, heat energy, machines, light and sound energy. Demonstrations,

exploratory experiences, display projects and a weekly science newsletter are utilized.

C. High School

Course Title Chemistry I

Grade Level 10, 11, 12

Prerequisites Algebra I with grade "C" or better

This course uses a laboratory approach to help students discover concepts that are reinforced and built upon in later units. Units taught include matter and its physical properties, changes of matter and energy, the solid, liquid and gas phases, chemical properties, atomic structure, quantum theory, chemical changes and thermodynamics, the periodic nature of elements, composition of compounds and nuclear reactions.

PROGRAM DESCRIPTION

Course Title _____

Grade Level _____

Prerequisites _____

CURRICULUM FABLE

Once upon a time the animals had a school. The curriculum consisted of running, climbing, flying, and swimming, and all the animals took all the subjects. The duck was good in swimming, better in fact, than his instructor. He made passing grades in flying, but he was particularly hopeless in running. Because he was low in this subject, he was made to stay in after school and drop his swimming class in order to practice running. He kept this up until he was only average in swimming. But average was acceptable, so nobody worried about that except the duck. The eagle was considered a problem pupil and was severely disciplined because, although he beat all the others to the top of the tree in climbing class, he insisted on using his own method. The rabbit started out at the top of the class in running, but he had a nervous breakdown and had to drop out of school because of so much makeup work in swimming. The squirrel led the class in climbing, but his flying teacher made him start his flying lessons from the ground up instead of from the top of the tree down. He developed charley horses from over-exertion at the takeoff and began getting C's in climbing and D's in running. The practical prairie dogs apprenticed their offspring to the badger when the school authorities refused to add digging to the curriculum. At the end of the year, an abnormal eel that could swim well, run a few feet, climb a bit, and fly a little was made valedictorian.

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EVALUATION OF CURRICULUM REVIEW

Your comments would be greatly appreciated for developing future Curriculum Review Handbooks. Please circle your responses for each statement and write any suggestions in the space provided.

0 = missing but needed
1 = unclear or not helpful
2 = little help
3 = somewhat helpful
4 = very helpful
5 = excellent

1. This book was useful in helping me understand the purpose for writing my philosophy.	0	1	2	3	4	5
2. The completion statements provided were helpful in writing my philosophy.	0	1	2	3	4	5
3. The list of student outcomes was beneficial in helping me write my own.	0	1	2	3	4	5
4. The examples of course outlines were adequate.	0	1	2	3	4	5
5. The Educational Program Worksheet was helpful in outlining my courses.	0	1	2	3	4	5
6. The Skills Worksheet helped me identify skills developed in each course.	0	1	2	3	4	5
7. The checklist for the Program Evaluation helped to identify needs.	0	1	2	3	4	5
8. The Resource Directory is useful in locating enrichment materials.	0	1	2	3	4	5
9. The Checklist of Essential Skills is useful in monitoring student progress.	0	1	2	3	4	5
10. The examples of program descriptions are helpful in writing our descriptions.	0	1	2	3	4	5

Comments: _____

_____

_____

Fold on indicated lines and stamp to mail.

_____

_____

_____

_____

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2500 North Lincoln
Oklahoma City, OK 73105